

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference 3174.1012004	FOR FURTHER ACTION	See item 4 below
International application No. PCT/US2004/019917	International filing date (<i>day/month/year</i>) 21 June 2004 (21.06.2004)	Priority date (<i>day/month/year</i>) 21 June 2003 (21.06.2003)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant APRILIS, INC.		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).
2. This REPORT consists of a total of 9 sheets, including this cover sheet.

In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

- | | | |
|-------------------------------------|--------------|---|
| <input checked="" type="checkbox"/> | Box No. I | Basis of the report |
| <input checked="" type="checkbox"/> | Box No. II | Priority |
| <input type="checkbox"/> | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| <input type="checkbox"/> | Box No. IV | Lack of unity of invention |
| <input checked="" type="checkbox"/> | Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/> | Box No. VI | Certain documents cited |
| <input type="checkbox"/> | Box No. VII | Certain defects in the international application |
| <input checked="" type="checkbox"/> | Box No. VIII | Certain observations on the international application |

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Date of issuance of this report 03 January 2006 (03.01.2006)
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PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

6/1

REC'D 19 NOV 2004

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To:

see form PCT/ISA/220

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/US2004/019917

International filing date (day/month/year)
21.06.2004

Priority date (day/month/year)
21.06.2003

International Patent Classification (IPC) or both national classification and IPC
G06K9/00

Applicant
APRILIS, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2004/019917

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
 - ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ in written format
 - ☐ in computer readable form
 - c. time of filing/furnishing:
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in computer readable form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2004/019917

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Box No. II Priority

1. ☒ The following document has not been furnished:

- ☒ copy of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(a)).
☐ translation of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(b)).

Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.
3. Additional observations, if necessary:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-24,26-124
	No: Claims	25
Inventive step (IS)	Yes: Claims	1-24,26-124
	No: Claims	25
Industrial applicability (IA)	Yes: Claims	1-124
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

- 1 The following documents are referred to in this communication:
- D1 : US 6 061 463 A (PHILLIPS NICHOLAS J ET AL) 9 May 2000 (2000-05-09)
 - D2 : US 4 544 267 A (SCHILLER MICHAEL) 1 October 1985 (1985-10-01)
 - D3 : US 6 341 028 B1 (BAHUGUNA RAMENDRA D ET AL) 22 January 2002 (2002-01-22)
 - D4 : M.P. GEORGES, V.S. SCAUFLAIRE, P.C. LEMAIRE: "Compact and portable holographic camera using photorefractive crystals. Application in various metrological problems" APPL. PHYS. B, vol. 72, 20 April 2001 (2001-04-20), pages 761-765, XP002304057

Re Item V. Reasoned statement concerning novelty, inventive step and industrial applicability

With the provisions at **point VIII** below, the following independent claims: 1, 2, 21, 32 and 73 seem neither known from nor rendered obvious by the available prior art. The features of independent claim 25 are, however, known (see e.g. D1, D2); therefore, claim 25 is not novel (**Art. 33(2) PCT**).

2 INDEPENDENT CLAIM 1

- 2.1 Document D1, which is considered to represent the most relevant state of the art, discloses (the references in parenthesis applying to this document):
- a waveguide, having an entrance edge and top and bottom surfaces (col. 8, l.20 - col. 9, l. 54, claim 1, Fig. 2, 3, 4);
 - a light source configured to direct a light beam (Fig. 2, elem. 1);
 - a skin contact layer (Fig. 2, elem. 5a);
 - a holographic element (Fig. 2, elem. 3);
 - a sensor array (Fig. 2, elem. 7b);
 - wherein the holographic optical element comprises a grating (col. 8, l. 24-31);
 - a supporting layer (Fig. 2, elem. 5a).
- 2.2 From this, the subject-matter of independent claim 1 differs in that:
- the grating layer and the supporting layer have substantially similar coefficients

of thermal expansion or thermo-optic coefficients or both.
The subject-matter of claim 1 is therefore novel (Article 33(2) PCT).

2.3 The problem to be solved by the present invention may be regarded as **how to compensate for the effects of change in temperature conditions which might influence the optical properties of the holographic optical element.**

2.4 Although the aforementioned problem is known in the context of other optical devices, the prior art concerning fingerprint sensors seem not to disclose nor to suggest as constructional solution for the holographic optical element the usage of materials which have substantially similar coefficients of thermal expansion or thermo-optic coefficients or both. Therefore, this solution is considered as involving an inventive step (**Article 33(3) PCT**).

3 INDEPENDENT CLAIM 2

3.1 Document D1, which is considered to represent the most relevant state of the art, discloses all the features of claim 2 (see point 2.1 above) except the feature of:
- providing means for compensating for changes in the Bragg matching condition of the holographic optical element due to changes in temperature.
The subject-matter of claim 2 is therefore novel (**Article 33(2) PCT**).

3.2 As soon as the objection regarding the phrasing in terms of a result to be achieved (see 8.1) would be circumvented by considering a more explicit statement which would clarify how the compensation is performed, the aforementioned claim can be considered as involving an inventive step (**Art. 33(3) PCT**) for the same reasons at stated at 2.3 above. By considering, for instance, features of dependent claims which imply as possible solution controlling the temperature of the holographic optical element and/or adjusting the angle of incidence would render the subject-matter of claim 2 novel and inventive.

3.4 Claims 3-20 are dependent on claim 2 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

4 INDEPENDENT CLAIM 21

- 4.1 Claim 21 lacks as essential feature the fact that the function of the "two co-locationally multiplexed holograms" (see 8.3 below) is to allow measurements of changes in the holographic element temperature. Without this essential feature a non-unity objection could have been raised. Such objection would have been justified since, from the wording of the claim alone, it might be inferred that the holograms can be used for a different purpose, thereby solving a different technical problem than compensating for temperature changes. By taking into account this essential feature, however, it is the underlying problem of warming up of the holographic optical element that still provides a common inventive concept.
- 4.2 For these reasons, it is considered that including the aforementioned feature into the subject-matter of claim 21 would render said claim as novel (**Article 33(2) PCT**).
- 4.3 For the same technical problem at 2.3 above, the proposed solution of measuring the temperature change is to provide two holograms and measure the difference in angle of multiplexing. Therefore, this solution is considered as involving an inventive step (**Article 33(3) PCT**).
- 4.4 Claims 22-24 are dependent on claim 21 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

5 INDEPENDENT CLAIM 25

- 5.1 The subject-matter of **claim 25** is not new in the sense of **Article 33(2) PCT**. Document D1 discloses (the references in parenthesis applying to this document):
- a waveguide, having an entrance edge and top and bottom surfaces (col. 8, l.20 - col. 9, l. 54, claim 1, Fig. 2, 3, 4);
 - a light source configured to direct a light beam (Fig. 2, elem. 1);
 - a skin contact layer (Fig. 2, elem. 5a);
 - a holographic element (Fig. 2, elem. 3);
 - a sensor array (Fig. 2, elem. 7b);
 - means for changing the wavelength of the light source (col. 9, l. 26-35).

- 5.2 Thus, all the features of claim 25 are disclosed by D1.
- 5.3 Dependent claims 27-31 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step (**Article 33(2) and (3) PCT**) since it is considered as well-established practice to vary different properties of light, such as polarisation, beam direction, etc. (see e.g. D1).
- 5.4 The combination of the features of dependent claim 26 is neither known from, nor rendered obvious by the available prior art. Although D2 acknowledges the problem of thermal effects which influence the functioning of the device (see, for instance, col. 11, l. 23-46), no explicit solution is proposed such as to compensate for the aforementioned effects. Therefore, providing a fingerprint sensor with means for changing the wavelength of the light source in response to temperature variation such as to compensate for temperature-induced changes in Bragg matching condition is considered as novel and inventive. Adding this feature to claim 25 would render the subject-matter of this claim as novel and inventive.

6 INDEPENDENT CLAIM 32

- 6.1 With the provision at 8.4 below, said claim is considered as novel (**Art. 33(2) PCT**) and inventive (**Art. 33(3) PCT**) because its features include all the features of claim 2. See, therefore, the remarks at point 3 above.
- 6.2 Claims 33-72 are dependent on claim 32 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

7 INDEPENDENT CLAIM 73

- 7.1 This claim is considered as novel (**Art. 33(2) PCT**) and inventive (**Art. 33(3) PCT**) since it is a method claim corresponding to the apparatus of claim 2 (see remarks at point 3 above).
- 7.2. Claims 74-124 depend on claim 32 and as such also meet the requirements of the

PCT with respect to novelty and inventive step.

Re Item VIII. Certain observations concerning the international application

- 8 The following clarity issues (**Art. 6 PCT**) are noted:
- 8.1 In claim 2, "means for compensating for changes in the Bragg condition" is formulated in terms of a result to be achieved since it is not clear what kind of changes are performed as to perform said compensation. As such, this passage can only be considered as a formulation of the problem to be solved.
- 8.2 Claims 26-31 are drafted to depend on claim 34 (not yet specified). It was considered that these claims depend on claim 25.
- 8.3 Claim 21, "co-locationally multiplexed holograms" is unclear. It was assumed that this term refers to two multiplexed holograms.
- 8.4 Claim 32, "wherein the light source is a broad wavelength spectrum light source, the wavelength of which can reconstruct the holographic optical element" is unclear. How can a light source "reconstruct" a hardware entity such as the optical element?
- 8.5 In claim 44, "the entrance edge has optical power" is unclear.
- 8.6 Claim 62 is drafted to depend on claim 76 (not yet specified); this claim is considered as dependent on claim 61.
- 8.7 In further prosecution of the application, the question of excessive proliferation of the number of independent claims from the same category might become relevant when the application would enter into an European phase (see Rule 29(2)(c) EPC).